PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-272207

(43)Date of publication of application : 21.10.1997

(51)Int.Cl. B41J 2/135
B23K 26/00
B41J 2/045
B41J 2/055

(21)Application number : 08-110313

(22)Date of filing : 05.04.1996

(71)Applicant : SONY CORP

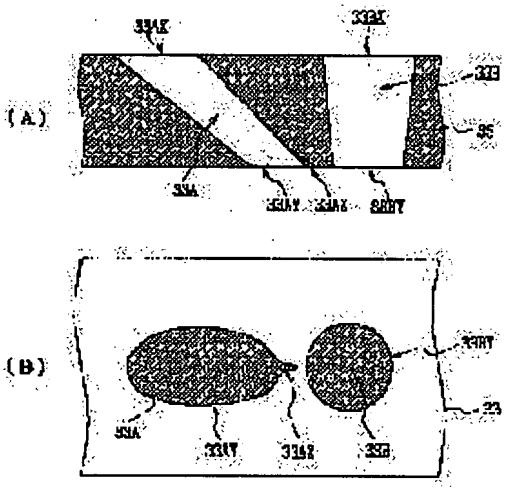
(72)Inventor : KIJIMA KOUICHIROU
IETOKU TAKASHI
ANDO MASATO

(54) PRODUCTION METHOD OF PRINTING HEAD

(57)Abstract:

PROBLEM TO BE SOLVED: To improve the reliability of the apparatus as a whole by forming a nozzle communicating with a solution storage room by projecting a laser beam on a film member joined to a face of a substrate via the solution storage room obliquely at a predetermined angle.

SOLUTION: A nozzle for a diluting liquid 33B is formed on a resin material to which a film member is joined. A nozzle 33A for an ink is formed by an excimer laser irradiation incident on a face of the resin material obliquely at predetermined angle at a normal output level from a face side of a solution room forming member via an ink liquid room and an ink introducing hole. Then by a further excimer laser irradiation of an about double output level, a tip portion 33AZ is formed in the nozzle 33A communicating with a nozzle 33AY for an ink. Ink forced out of the nozzle 33A is discharged along the tip portion 33AZ so as to be mixed with a preferable orientation with respect to the nozzle 33B for a diluting liquid.



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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Table of Contents] This invention is explained in order of the following.
The technical field Prior art to which invention belongs (drawing 25)
The configuration of the gestalt (1) 1st example (1-1) "carrier jet" printer equipment of operation of technical-problem The means for solving a technical problem invention which invention tends to solve (drawing 1 - drawing 4)
(1-2) The configuration of a "carrier jet" print head (drawing 5 - drawing 6)
(1-3) Actuation of a "carrier jet" print head (drawing 7 (A) - drawing 9 (C))
(1-4) The manufacture approach of a "carrier jet" print head (drawing 10)
(1-5) The configuration of laser-beam-machining equipment (drawing 11 - drawing 15 (B))
(1-6) Actuation and effectiveness (drawing 16 (A) and (B)) of the 1st example
(2) The configuration of the 2nd example (2-1) "carrier jet" print head (drawing 17 - drawing 18 (B))
(2-2) The formation approach of of the reflective film and water-repellent membrane to an orifice plate (drawing 19 (A) and (B))
(2-3) The laser-beam-machining approach for the reflective film and a water-repellent membrane (drawing 20 (A) - drawing 22)
(2-4) Actuation, and the example besides effectiveness (3) (drawing 23 and drawing 24) of the 2nd example Effect of the invention [0002]
[Field of the Invention] This invention is applied to the print head in on-demand mold ink jet printer equipment (this is only hereafter called ink jet printer equipment), concerning the manufacture approach of a print head, and is suitable.
[0003]
[Description of the Prior Art] Conventionally, this kind of ink jet printer equipment is printer equipment which breathes out a liquid ink drop from an ink regurgitation nozzle (it is only hereafter called a nozzle) according to a record signal, and carries out the print of the image to record media, such as paper and a film, and since it can realize miniaturization and low cost-ization, it is spreading quickly in recent years.
[0004] In this ink jet printer equipment, there are a method of using a piezoelectric device and an approach using a heater element as approach of carrying out the regurgitation of the liquid ink drop. A liquid ink drop is made to breathe out from a nozzle by giving a pressure to the liquid ink room where making the approach using a piezoelectric device deform a piezoelectric device is therefore filled up with ink. Moreover, therefore, the approach using a heater element makes the pressure of the bubble generated by therefore carrying out heating ebullition of the ink in a heater element breathe out a liquid ink drop from a nozzle.
[0005] There is the approach of incurvating a diaphragm and pressing a liquid ink room by giving an electrical potential difference to the approach of pressing a liquid ink room through a diaphragm, and the piezoelectric device by which the laminating was carried out to the piezoelectric device of the veneer mold stuck on the diaphragm, or two-layer by carrying out the variation rate of the laminating mold piezoelectric device which comes to carry out the laminating of the three or more piezoelectric devices stuck on the diaphragm to the approach using this piezoelectric device linearly.
[0006] Here shows the example of 1 configuration of the print head in this kind of ink jet printer equipment to drawing 25 . In the print head 1, it is formed so that it may expose to the whole surface 2A side of a pedestal 2,

and it is open for free passage to the ink passage 3A and 3B which supplies the ink supplied from an ink tank (not shown), and the ink passage 3A and 3B concerned, and the liquid ink room 4 formed so that it might expose to the whole surface 2A side of a pedestal 2 is formed. moreover -- a pedestal 2 -- ink passage 3B -- open for free passage -- a pedestal 2 -- the ink installation hole 5 is formed so that it may expose to 2B side on the other hand.
[0007] Therefore, the diaphragm 6 has pasted adhesives (not shown) so that the ink passage 3A and 3B and the liquid ink room 4 may furthermore be covered to whole surface 2A of a pedestal 2. the location corresponding to the liquid ink room 4 in whole surface 6A of a diaphragm 6 -- a piezoelectric device 7 -- adhesives (not shown) -- therefore -- adhesion -- now, it is. Moreover, on the other hand, the nozzle formation member (this is hereafter called an orifice plate) 8 in which nozzle 8A for [of a pedestal 2] it being open for free passage to the ink installation hole 5 at 2B, and carrying out the regurgitation of the ink was formed is formed.
[0008] In this print head 1, if a predetermined pressure is impressed to a piezoelectric device 7, it will curve in the direction which the piezoelectric device 7 concerned is therefore shrunken by the bimorph effectiveness at field inboard, and is shown by the arrow head a, and, therefore, a diaphragm 6 will curve to this in the direction shown by the arrow head a. As a result, the volume of the liquid ink room 4 decreases, the pressure in the liquid ink room 4 rises, and it is made as [breathe / from nozzle 8A / ink].
[0009] Document preparation using the computer called disk top publishing comes to be performed briskly, and the demand of outputting the natural image of the color of an alphabetic character, a not only a graphic form but a photograph, etc., etc. with an alphabetic character and a graphic form has been increasing here in recent years. Thus, reappearance of halftone is important in order PUNRITO [a high-definition natural image]. Changing the electrical potential difference and pulse width which are given to a piezoelectric device or a heater element in order to reproduce halftone here, what therefore expresses the path of a printing dot as adjustable to control the drop size which carries out the regurgitation, and the diameter of a dot have some which constitute 1 pixel from a matrix which consists of 4x4 dots, without making it change, and perform a gradation expression using the so-called dither in this matrix unit.
[0010] However, in the print head of ink jet printer equipment, by the approach of controlling the drop size which therefore carries out the regurgitation to changing the electrical potential difference given to a piezoelectric device or a heater element and pulse width, since it becomes impossible to carry out the regurgitation of the ink when the electrical potential difference and pulse width which are given to a piezoelectric device or a heater element are lowered too much, a limitation is in the diameter of the minimum drop. This result, especially a low-concentration expression cannot be performed, but the gradation number of stages which can be expressed decreases. Moreover, since resolution deteriorates to one fourth when it prints, for example with the same dot density as an above-mentioned approach, although the concentration of 17 gradation can be expressed when 1 pixel is therefore constituted from a matrix of 4x4 in the approach of performing a gradation expression using a dither, granularity is **** intermediary ******. Thus, in order to print out a natural image also in which approach, it is still inadequate practically, and it is ******.
[0011] Then, "carrier jet" printer equipment is proposed as what has improved the fault of such ink jet printer equipment recently. In the print head of "carrier jet" printer equipment, the 1st nozzle which quantifies and carries out the regurgitation of the ink, and the 2nd nozzle which carries out the regurgitation of the diluent are prepared, and gradation is given in a dot by making into one the ink breathed out from the 1st nozzle, and the diluent breathed out from the 2nd nozzle, and changing ink concentration. Also in this "carrier jet" printer equipment, the regurgitation function of the same liquid ink drop as ink jet printer equipment is needed, and, generally the approach using a piezoelectric device or the approach using a heater element is used like ink JITSUTO printer equipment as an approach of carrying out the regurgitation of the drop.
[0012] In this "carrier jet" printer equipment, a liquid ink room and a diluent room keep predetermined spacing in a pedestal, and are established in it, and the nozzle for ink and the nozzle for diluents which are open for free passage in a liquid ink room and a diluent room, respectively are prepared in the orifice plate. Moreover, while the piezoelectric device for impressing a pressure to a liquid ink room is arranged through a diaphragm in the location corresponding to the liquid ink room concerned, the piezoelectric device for impressing a pressure to a diluent room is arranged through the diaphragm in the location corresponding to the diluent room concerned. Furthermore, the ink passage and the dilution liquid flow channel which are open for free passage, respectively, the ink installation hole which is open for free passage for a liquid ink room and the nozzle for ink, and the diluent installation hole which is open for free passage for a diluent room and the nozzle for diluents are formed

in the liquid ink room and the diluent room at the pedestal.
[0013]
[Problem(s) to be Solved by the Invention] By the way, it is necessary to make the liquid which carries out the regurgitation reach the target with a precision sufficient on record media, such as paper, in the print head of these ink jet printer equipment and "carrier jet" printer equipment. When reproducing a character, natural drawings, etc., such as an alphabetic character, with high definition especially on a record medium, even if few on a record medium The small diameter of a dot below 200 [mum] is required. For this reason, it is even if few. It is the path of 30-50 [mum] extent desirably, and below 100 [mum], it is necessary to form a nozzle in an orifice plate so that an aspect ratio may become one or more, and high process tolerance is required.
[0014] In this case, it is difficult to fill the above conditions with the approach using a drill as a nozzle processing means, since a limitation is to make the diameter of processing into min. Intermediary ******** [as] for which many approaches of drilling the through tube for nozzles in an orifice plate in recent years using laser, such as excimer laser, are used that it should correspond to these demands.
[0015] On the other hand, without leaving the hysteresis of front image data in a carrier jet print head, so that a gradation expression can be reproduced correctly, it is required that the amount of ink should be controlled to timely and, for this reason, it needs to mix ink and a diluent in a respectively suitable amount. For this reason, it becomes a requirement to set near the nozzle tip and to make ink mix and separate promptly.
[0016] thus, the liquid a quantum is carried out [liquid] by the nozzle by the side of a quantum in order to make optimum dose mix ink and a diluent -- the nozzle of a discharge side -- ** -- to go straight on if possible and to extrude once, is demanded. After mixing ink and a diluent furthermore, while producing separation of a meniscus promptly, it is necessary to make a meniscus form promptly the liquid extruded from the nozzle by the side of a quantum in a location equal to a standby condition.
[0017] Furthermore, in a carrier jet printer, although water repellent finishing is performed between the nozzle tip of a discharge side, and the nozzle tip by the side of a quantum so that it may be stabilized and a drop can be breathed out, it is required between the nozzle tips concerned for the liquid extruded from the nozzle by the side of a quantum to become easy to flow irrespective of the existence of water repellent finishing.
[0018] The method of making mixing with the liquid of a discharge side and the liquid by the side of a quantum and separation perform promptly through the slot concerned by processing the slot of a suitable configuration between the nozzle of a discharge side and the nozzle by the side of a quantum that it should correspond to such a demand is proposed.
[0019] by the way, in forming in an orifice plate the through tube for nozzles, and the slot between the nozzles mentioned above using laser, such as excimer laser From being formed from the plane of incidence of laser in the shape of [to which ** or an intermediary bore diameter becomes small in an outgoing radiation side] a taper In order to perform nozzle processing, it is necessary to process a through hole for the liquid with which the regurgitation or a quantum is made from the wall side of each liquid room, and on the other hand, in order to process a slot, it is necessary to perform processing from the outer wall side of a liquid room.
[0020] However, the complicatedness that an orifice plate must be attached free [attachment and detachment] to the stage for laser beam machining (not shown) in a phase by nozzle processing and recessing in the middle of a processing process since the processing sides by the laser of an orifice plate differ is ******. That is, the complicatedness which must turn an orifice plate over to process a slot between each nozzle concerned after processing the nozzle by the side of a quantum and the nozzle of a discharge side, respectively is ******.
[0021] The problem from which it becomes very difficult for alignment precision advanced although the location of a slot is doubled to between the tips of each nozzle concerned between the tips of each nozzle concerned in case a slot is processed after carrying out alignment of the nozzle by the side of a quantum and the nozzle of a discharge side, respectively and processing them furthermore to be considered as a demand, and to perform the alignment concerned is ******.
[0022] This invention was made in consideration of the above point, and tends to propose the manufacture approach of the print head which may improve the productivity and dependability as the whole equipment.
[0023]
[Means for Solving the Problem] In order to solve this technical problem, it sets to this invention. In the manufacture approach of a print head that the orifice plate by which the exterior and a nozzle open for free passage were formed in the whole surface side of the pedestal in which the solution stockroom was established

was put By putting the film-like member which consists of predetermined material which becomes the whole surface of a pedestal the origin of an orifice plate, and irradiating a laser beam aslant at a predetermined include angle to the whole surface of a film-like member through the solution stockroom of a pedestal after forming a solution stockroom and a nozzle open for free passage and forming a nozzle, by raising the output level of a laser beam predetermined twice, on the other hand, a film-like member is alike, and the edge of a nozzle and a slot open for free passage are formed. Consequently, the regurgitation of a solution and separation can be made to perform promptly through the slot concerned.

[0024] Moreover, it sets to the manufacture approach of a print head that the orifice plate in which the exterior and a nozzle open for free passage were formed was put on the whole surface side of the pedestal in which the solution stockroom was established in this invention. While putting the film-like member which consists of predetermined material which becomes the whole surface of a pedestal the origin of an orifice plate By carrying out laminating formation of the 1st thin film which has a predetermined reflection factor in the film-like member concerned, and irradiating a laser beam aslant at a predetermined include angle to the whole surface of a film-like member through the solution stockroom of a pedestal After forming a solution stockroom and a nozzle open for free passage and forming a nozzle, it is based on the reflected light from which a laser beam is obtained by reflecting with the 1st thin film. after a film-like member is alike on the other hand, forming the edge of a nozzle, and a slot open for free passage and forming a slot, while removing the 1st thin film which counters a slot based on the reflected light, it is made to carry out opening of the 1st thin film so that it may be open for free passage with a nozzle based on laser beams other than the reflected light. consequently -- while being able to make the regurgitation of a solution, and separation perform promptly through the slot concerned -- the amount of a solution -- a minute amount -- ****** -- enough -- the regurgitation -- and it can be made to dissociate

[0025]

[Embodiment of the Invention] About a drawing, one example of this invention is explained in full detail below.

[0026] (1) In the block diagram 1 of the 1st example (1-1) "carrier jet" printer equipment, 10 shows the serial mold "carrier jet" printer equipment which applied this invention as a whole, and is made as [carry out / based on the rotation output given to a drum 15 through a pulley 12, a belt 13, and a pulley 14 one by one from a motor 11 / the rotation drive of the drum 15 concerned].

[0027] The paper presser foot 16 is arranged on the periphery of this drum 15 at the shaft orientations of the drum 15 concerned, and parallel, and it is made as [press / to the drum 15 concerned / the print paper 17 as printed matter-ed wound around the drum 15 by the paper presser foot 16 concerned]. Moreover, while a feed screw 18 is arranged at the shaft orientations of a drum 15, and parallel at the periphery of a drum 15, the print head 19 shown in drawing 3 is screwed in the feed screw 18 concerned, and it is made as [make / therefore / to carry out the rotation drive of the feed screw 18 in this way / it / move this print head 19 to the shaft orientations of a drum 15].

[0028] A control section 20 has the 1st driver 61 for ink regurgitation, and the 2nd driver 62 for diluent regurgitation here while having the signal-processing control circuit 21 which consisted of microcomputers containing CPU or DSP (Digital SignalProccessor), as shown in drawing 2 . The signal-processing control circuit 21 generates the driving signal which should be given to a print head 19 based on the input signal S1 supplied to a control section 20, and is made as [carry out / as this is sent out to a print head 19 as driving signals S2 and S3 through the 1st driver 22 and 23, respectively / drive control of the print head 19 concerned].

[0029] Under the present circumstances, the signal-processing control circuit 21 records the print data obtained based on an input signal S1 on the memory 24 which consisted of line buffer memory or 1 screen memory if needed. While rearranging print data into print sequence by reading this suitably after this The amendment data stored in the amendment circuit 25 in ROM (read only memory) map form if needed are read, and it is made as [perform / gamma correction value of print data, color correction in the case of a color, etc. / based on the amendment data concerned].

[0030] Moreover, by generating control signal S4 and S5 based on an input signal S1, and sending these out to the motor 11 which corresponds as drive control signals S6 and S7 through the drive control section 26, respectively, or the drive motor of a feed screw 18, the signal-processing control circuit 21 carries out drive control of these motors 11 or the drive motor of a feed screw 18, and is made as [control / in this way / actuation of a drum 11 and a feed screw 18].

[0031] It sets to this serial mold "carrier jet" printer equipment 10 in this way. While moving a print head 19 to

the shaft orientations of a drum 15 with constant speed by the drive motor of a feed screw 18 driving based on the drive control signal S7 supplied from a control section 20 at the time of actuation, and rotating a feed screw 18 with a predetermined angular velocity When a print head 19 drives based on the driving signals S2 and S3 supplied from a control section 20 at this time, one line is printed to the print paper 17.

[0032] After this printing for one line is furthermore completed, while making the print paper 17 send by one line when it drives based on the drive control signal S6 with which a motor 11 is supplied from a control section 20 and only a predetermined include angle rotates a drum 15 Under the present circumstances, by driving based on the drive control signal S7 with which the drive motor of a feed screw 18 is supplied from a control section 20, and rotating a feed screw 18, a print head 19 is returned to the home position of the migration direction, and the same actuation is repeated after this.

[0033] Thus, this serial mold "carrier jet" printer equipment 10 is made as [perform / based on the input signal S1 supplied to a control section 20 / the print per line], and is made as [carry out / all over the print paper 17 / the ****** print of the alphabetic character and graphic form based on the print data obtained from an input signal S1 in this way, the image, etc.].

[0034] In practice, these 1st and 2nd drivers 22 and 23 are formed according to the number of the nozzle for ink, and the nozzles for diluents, respectively. The 1st driver 22 carries out drive control of the piezo-electric element (this is hereafter called the piezo-electric element for ink) (quantum side) prepared in order to make ink breathe out from the nozzle for ink regurgitation so that it may mention later, and carries out drive control of the piezo-electric element (this is hereafter called the piezo-electric element for diluents) (discharge side) prepared in order for the 2nd driver 23 to make a diluent breathe out from the nozzle for diluent regurgitation. These 1st and 2nd drivers 22 and 23 carry out drive control of the piezo-electric element for ink and the piezo-electric element for diluents which correspond based on control of the serial parallel conversion circuit 27 and the timing control circuit 28 (drawing 3) which were prepared in the signal-processing control circuit 21, respectively.

[0035] That is, as shown in drawing 3 , the serial parallel conversion circuit 27 sends out the digital halftone data D1 to the 1st and 2nd drivers 22 and 23, respectively. The timing control circuit 27 sends out a timing signal to the 1st and 2nd drivers 22 and 23 to predetermined timing, respectively, if the printing trigger signal T1 is received. This printing trigger signal T1 is sent out to printing timing in the timing control circuit 28 at the time of ******. The 1st and 2nd driver circuits 22 and 23 send out the driving signals S2 and S3 according to the data obtained from the serial parallel conversion circuit 27 synchronizing with the timing according to the timing signal acquired from the timing control circuit 28, respectively to the piezo-electric element for ink and the piezo-electric element for diluents which correspond, respectively.

[0036] The timing control circuit 28 sends out a timing signal to the 1st and 2nd drivers 22 and 23 here, respectively so that it may become timing as the timing of the driver voltage impressed to the piezo-electric element for ink and the piezo-electric element for diluents (the piezo-electric element for ink and the piezo-electric element for diluents correspond to a pair, the nozzle for intermediary **** ink, and the nozzle for diluents in this case, respectively) shows to drawing 4 . In the case of this example, a regurgitation period is 1 [msec] (frequency 1 [kHz]), and quantum mixing of ink and the regurgitation of a drop are performed in the meantime. Moreover, when the digital halftone data D1 given from the serial parallel conversion circuit 27 are below a predetermined threshold, an ink quantum and the regurgitation do not carry out.

[0037] (1-2) The configuration of the configuration "carrier jet" print head 19 of a "carrier jet" print head is shown in drawing 5 and drawing 6 . As shown in drawing 5 , the "carrier jet" print head 19 While the diaphragm 32 has therefore pasted adhesives (not shown) at whole surface 31A of the solution room formation member 31 which becomes with tabular The orifice plate 33 of the solution room formation member 31 set to 31B with tabular on the other hand pastes up. whole surface 32A of a diaphragm 32 -- heights 34 and 35 -- minding -- respectively -- laminating piezo -- 36 (equivalent to the 1st above-mentioned piezo-electric element) and 37 (equivalent to the 2nd above-mentioned piezo-electric element) are joined and constituted.

[0038] the solution room formation member 31 -- thickness -- almost -- It becomes by the stainless steel of 0.1 [mm]. While liquid ink room 31C, ink installation hole 31D, and ink passage 31E, ink buffer tank 31F, and connection hole 31G are formed in this solution room formation member 31, diluent room 31H, diluent installation hole 31I, dilution liquid flow channel 31J, diluent buffer tank 31K, and connection hole 31L is formed.

[0039] liquid ink room 31C can be set in the thickness direction of the solution room formation member 31 -- it is

formed so that it may expose to the whole surface 31A side of the solution room formation member 31 from a center position mostly. ink installation hole 31D -- the liquid ink room 31C bottom -- liquid ink room 31C -- open for free passage -- and the solution room formation member 31 -- it is formed so that it may expose to the 31B side on the other hand. Moreover, as shown in drawing 6 , the diameter of ink installation hole 31D is selected by the same die length as the width of face of liquid ink room 31C.

[0040] ink passage 31E can be set in the thickness direction of the solution room formation member 31 -- almost -- a center position to the solution room formation member 31 -- it is formed so that it may expose to the 31B side on the other hand. Moreover, ink passage 31E is a hole 31E1. It minds, and it is open for free passage to liquid ink room 31C, and ink installation hole 31D and predetermined spacing are kept, and it is formed. Ink buffer tank 31F are formed so that it may be open for free passage to ink passage 31E and may expose to the whole surface 31A side of the solution room formation member 31. As shown in drawing 6 here, ink buffer tank 31F are a liquid ink room common to piping of one in which two or more ink passage 31E was attached, i.e., each liquid ink room 31C, and these ink buffer tank 31F constitute some ink buffer tanks 38 (drawing 6) in practice. Connection hole 31G are formed so that it may be open for free passage to ink buffer tank 31F and may expose to the whole surface 31A side of the solution room formation member 31.

[0041] While touching the inferior surface of tongue of liquid ink room 31C, one side face of ink installation hole 31D, and one side face of ink passage 31E, respectively, to the solution room formation member 31 here Member 31M of the solution room formation member 31 which, on the other hand, form a part of 31B, 31 Ns of members which form a part of whole surface 31A of the solution room formation member 31 while touching one side face of liquid ink room 31C, the top face of ink passage 31E, and one side face of connection hole 31G, So that whole surface 31A and member 31O which, on the other hand, forms a part of 31B of the solution room formation member 31 may be formed, while touching one side face of ink buffer tank 31F, and the side face of another side of connection hole 31G, respectively Liquid ink room 31C, ink installation hole 31D, and ink passage 31E, ink buffer tank 31F, and connection hole 31G are formed.

[0042] a diluent room -- 31H can be set in the thickness direction of the solution room formation member 31 -- it is formed so that it may expose to the whole surface 31A side of the solution room formation member 31 from a center position mostly. diluent installation hole 31I -- a diluent room -- 31H bottom -- a diluent room -- 31H -- open for free passage -- and the solution room formation member 31 -- it is formed so that it may expose to the 31B side on the other hand. Moreover, as shown in drawing 6 , the diameter of diluent installation hole 31I is selected by the same die length as the width of face w of diluent room 31H.

[0043] dilution liquid flow channel 31J can be set in the thickness direction of the solution room formation member 31 -- almost -- a center position to the solution room formation member 31 -- it is formed so that it may expose to the 31B side on the other hand. Moreover, dilution liquid flow channel 31J are hole 31J1. It minds, and it is open for free passage to diluent room 31H, and diluent installation hole 31I and predetermined spacing are kept, and it is formed. Diluent buffer tank 31K are formed so that it may be open for free passage to dilution liquid flow channel 31J and may expose to the whole surface 31A side of the solution room formation member 31. As shown in drawing 6 here, diluent buffer tank 31K are a diluent room common to piping of one in which two or more dilution liquid flow channel 31J were attached, i.e., each diluent room 31H, and these diluent buffer tank 31K constitute some diluent buffer tanks 40 (drawing 6) in practice. Connection hole 31L is formed so that it may be open for free passage to diluent buffer tank 31K and may expose to the whole surface 31A side of the solution room formation member 31.

[0044] While touching the inferior surface of tongue of diluent room 31H, one side face of diluent installation hole 31I, and one side face of dilution liquid flow channel 31J, respectively, to the solution room formation member 31 here Member 31P of the solution room formation member 31 which, on the other hand, form a part of 31B, Member 31Q which forms a part of whole surface 31A of the solution room formation member 31 while touching one side face of diluent room 31H, the top face of dilution liquid flow channel 31J, and one side face of connection hole 31L, So that whole surface 31A and member 31R which, on the other hand, forms a part of 31B of the solution room formation member 31 may be formed, while touching one side face of diluent buffer tank 31K, and the side face of another side of connection hole 31L, respectively Diluent room 31H, diluent installation hole 31I, dilution liquid flow channel 31J, diluent buffer tank 31K, and connection hole 31L is formed. Moreover, it is surrounded by the side face of another side of liquid ink room 31C, the side face of another side of ink installation hole 31D, the side face of another side of diluent room 31H, and the side face of another side

of diluent installation hole 31I, and whole surface 31A of the solution room formation member 31 and member 31S which, on the other hand, form a part of 31B are formed.
[0045] the solution room formation member 31 -- on the other hand -- 31B -- ink installation hole 31D and ink passage 31E, ink buffer tank 31F, and diluent installation hole 31I, dilution liquid flow channel 31J, and diluent buffer tank 7IK -- a wrap -- therefore, the orifice plate 33 has pasted thermocompression bonding like. This orifice plate 33 becomes by the neo flex time (trade name) by Mitsui Toatsu Chemicals Industries excellent in thermal resistance and chemical resistance, and a glass transition point by about 50 [mum] It becomes below by 250 [**]. [thickness]
[0046] It is open for free passage to ink installation hole 31D, and it is aslant formed in this orifice plate 33 so that the nozzle 33B side for diluents which nozzle 33A for ink which has a diameter of predetermined for carrying out the regurgitation of the ink supplied through ink installation hole 31D from liquid ink room 31C mentions later may be turned to. Moreover, it is open for free passage to diluent installation hole 31I, and has a diameter of predetermined for carrying out the regurgitation of the diluent supplied through diluent installation hole 31I from diluent room 31H in an orifice plate 33, and nozzle 33B for diluents a cross-section configuration comes to be circular is formed in it. In this case, since nozzle 33for ink A and nozzle 33B for diluents are formed in the orifice plate 33 which becomes by neo flex time, the chemical stability over ink and a diluent is securable. Ink installation hole 31D and diluent installation hole 31I is formed here so that it may become larger than the path of nozzle 33for ink A, and nozzle 33B for diluents.
[0047] therefore, in the this "carrier jet" print head 19 the solution room formation member 31, while ink passage 31E and dilution liquid flow channel 31J are formed so that it may expose to the 31B side on the other hand the solution room formation member 31 -- on the other hand, therefore, an orifice plate 33 pastes 31B at thermocompression bonding -- having -- ink passage 31E and dilution liquid flow channel 31J -- a wrap, since it is made like It is made as [prevent / that ink passage 31C and dilution liquid flow channel 31J are therefore closed by adhesives like before / it / beforehand].
[0048] On the other hand, therefore, the diaphragm 32 which becomes with nickel has pasted the adhesives (not shown) of for example, an epoxy system so that liquid ink room 31C and diluent room 31H may be covered to the whole surface 31A side of the solution room formation member 31. Through tube 32B and through tube 32C are drilled in the location corresponding to connection hole 31G and connection hole 31L of the solution room formation member 31 by this diaphragm 32, respectively. The ink supply pipe 39 and the diluent supply pipe 41 which were connected to the ink tank and the diluent tank (not shown), respectively are attached in these through tubes 32B and 32C. Therefore, liquid ink room 31C is filled up with the ink supplied to ink passage 31E through the ink supply pipe 39 and the ink buffer tank 38 from an ink tank, and diluent room 31H is filled up with the diluent supplied to dilution liquid flow channel 31J through the diluent supply pipe 41 and the diluent buffer tank 40 from a diluent tank.
[0049] Moreover, while the height 34 and height 35 which become with tabular have therefore pasted adhesives (not shown), therefore, the heights 34 and 35 concerned were attained to laminating piezo 36 at adhesives (not shown), respectively, and 37 has pasted the location corresponding to liquid ink room 31C and diluent room 31H in whole surface 32A of a diaphragm 32, respectively. The magnitude of these heights 34 and 35 is selected so that it may become smaller than the whole surface 36A and 37A which reaches laminating piezo 36, respectively and the heights 34 and 35 of 37 paste up.
[0050] The laminating of a piezo-electric member and the conductive member is carried out in the direction parallel to whole surface 32A of a diaphragm 32 by turns, and, therefore, laminating piezo 36 is joined and constituted by adhesives (not shown) in the adhesion side of a height 34. ******. of the number of laminatings of a piezo-electric member and a conductive member is also good here how many. Impression of driver voltage makes this laminating piezo 36 as [increase / the volume of liquid ink room 31C] by raising focusing on the part which displaced linearly in the direction contrary to the direction shown in drawing by the arrow head a, and the height 34 of a diaphragm 32 has pasted up.
[0051] Moreover, if driver voltage is released, by displacing linearly in the direction shown in drawing by the arrow head a, and pressing a height 34, laminating piezo 36 will incurvate a diaphragm 32, will decrease the volume of liquid ink room 31C, and, therefore, will raise the pressure in liquid ink room 31C to this. in this case, the magnitude of a height 34 -- laminating piezo -- since it is formed smaller than whole surface 36A of 36 -- laminating piezo -- the variation rate of 36 can be intensively transmitted to the location corresponding to liquid

ink room 31C of a diaphragm 32.
[0052] The laminating of a piezo-electric member and the conductive member is carried out in the direction parallel to whole surface 32A of a diaphragm 32 by turns, and, therefore, laminating piezo 37 is joined and constituted by adhesives (not shown) in the adhesion side of a height 35. ****** of the number of laminatings of a piezo-electric member and a conductive member is also good here how many. Impression of driver voltage makes this laminating piezo 37 as [increase / the volume of diluent room 31H] by raising focusing on the part which displaced linearly in the direction shown in drawing by the arrow head a, and the height 35 of a diaphragm 32 has pasted up.
[0053] Moreover, if driver voltage is released, by displacing linearly in the direction shown in drawing by the arrow head a, and pressing a height 35, laminating piezo 37 will incurvate a diaphragm 32, will decrease the volume of diluent room 31H, and, therefore, will raise the pressure in diluent room 31H to this. in this case, the magnitude of a height 35 -- laminating piezo -- since it is formed smaller than whole surface 37A of 37 -- laminating piezo -- the variation rate of 37 -- the diluent room of a diaphragm 32 -- it can transmit to the location corresponding to 31H intensively.
[0054] As shown in drawing 6 here, as shown in drawing 6 , in the "carrier jet" print head 19, two or more formation of liquid ink room 31C, ink installation hole 31D, and ink passage 31E, nozzle 33for ink A, diluent room 31H, diluent installation hole 31I, dilution liquid flow channel 31J, and the nozzle 33B for diluents is carried out, respectively. moreover, each liquid ink room 31C and each diluent room -- each corresponding to 31H -- a height 34 and laminating piezo 36, a height 35, and laminating piezo 37 are prepared.
[0055] (1-3) actuation of a "carrier jet" print head -- such -- the "carrier jet" print head 19 -- laminating piezo -- when predetermined driver voltage is given to 36 and 37, it is shown in drawing 7 (A) -- as -- laminating piezo -- 36 and 37 are displaced in the direction contrary to the direction shown by the arrow head a, respectively. Since the part corresponding to liquid ink room 31C and diluent room 31H in a diaphragm 32 is therefore raised by this in the direction shown by the arrow head a, the volume of liquid ink room 31C and diluent room 31H increases.
[0056] If the volume of liquid ink room 31C and diluent room 31H increases, the meniscus of nozzle 33for ink A and nozzle 33B for diluents will once retreat to the liquid ink room 31C and diluent room 31H side, respectively, but if it reaches laminating piezo 36 and the variation rate of 37 is subsided, therefore, it is stabilized in the balance with surface tension at the tip of nozzle 33for ink A, and nozzle 33B for diluents, and will be in a regurgitation standby condition (drawing 8 (A)).
[0057] the time of an ink quantum -- setting -- laminating piezo -- the driver voltage currently impressed to 36 is released and, as a result, it is shown in drawing 7 (B) -- as -- laminating piezo -- when 36 displaces in the direction shown by the arrow head a, a diaphragm 32 displaces in the direction shown by the arrow head a. The volume in liquid ink room 31C decreases by this, and the pressure in liquid ink room 31C rises.
[0058] in this case, laminating piezo -- since it is gently set up so that ink may not carry out the regurgitation of the time amount change of the driver voltage given to 36 from nozzle 33for ink A, ink will extrude, without the ability breathing out from nozzle 33for ink A. here -- laminating piezo -- since the electrical-potential-difference value when releasing the driver voltage currently impressed to 36 is set as the value according to the gradation of image data, the amount of ink extruded from the tip of nozzle 33A for ink turns into an amount according to image data. The ink in the condition of having extruded from this nozzle 33for ink A contacts the diluent which forms the meniscus [near the point of nozzle 33B for diluents], and is mixed (drawing 8 (B)).
[0059] the time of the ink regurgitation -- setting -- laminating piezo -- the driver voltage currently impressed to 37 is released and, as a result, it is shown in drawing 7 (C) -- as -- laminating piezo -- when 37 displaces in the direction shown by the arrow head a, a diaphragm 32 displaces in the direction shown by the arrow head a. The volume of diluent room 31H decreases by this, the pressure in diluent room 31H rises, and a diluent is extruded from nozzle 33for diluents B (drawing 8 (C)). then, the driver voltage currently impressed to laminating piezo 36 cancels -- having -- laminating piezo -- 36 returns to an initial state. Thereby, ink is drawn in the liquid ink room 31C side, and the mixed solution by which the quantum was carried out is formed (drawing 8 (D)).
[0060] then, the driver voltage of laminating piezo 37 releases -- having -- thereby -- laminating piezo -- it displaces in the direction where 37 is contrary to the direction shown by the arrow head a, and a diluent is drawn in the diluent room 31H side. Consequently, the mixed solution which has the ink concentration according to image data is separated from a diluent, and is breathed out from nozzle 33for diluents B (drawing 9 (A) and drawing 9 (B)). Then, the internal pressure in nozzle 33for ink A, liquid ink room 31C and nozzle 33for diluents

B, and diluent room 31H returns, and, therefore, a capillary tube pressure is re-filled up with ink and a diluent at nozzle 33for ink A, and nozzle 33B for diluents (drawing 9 (C)).
[0061] Therefore, ink passage 31E and dilution liquid flow channel 31J do not have the thing of the solution room formation member 33 of 33 orifice plate for which ink passage 31E and dilution liquid flow channel 31J are therefore closed by adhesives since the 31B side is pasted on the other hand in thermocompression bonding here, without [of the solution room formation member 31] being formed in 31B on the other hand, and moreover using adhesives. Therefore, since it can avoid that ink passage 31E and passage resistance of dilution liquid flow channel 31J go up, it is stabilized and the regurgitation of the mixed solution which has the ink concentration according to image data can be carried out.
[0062] Moreover, since the this "carrier jet" print head 19 consists of laminated structures with the orifice plate 33 which becomes with the solution room formation member 31 which becomes by stainless steel, and a resin ingredient, it can make small deformation of the orifice plate 33 at the time of a pressure being impressed to liquid ink room 31C and diluent room 31H as compared with the case where the solution room formation member 31 and an orifice plate 33 are constituted from a resin ingredient. therefore, effective [amount / of ink / according to image data / it is stabilized, and / in effective and the mixed solution which consists of nozzle 33for diluents B by the ink concentration according to image data] from nozzle 33for ink A, while being able to extrude -- and it can be made to stabilize and breathe out
[0063] in this case, liquid ink room 31C and a diluent room -- more effective [amount / of ink / according to image data / it is stabilized, and / in more effective and the mixed solution which consists of nozzle 33for diluents B by the ink concentration according to image data] from nozzle 33for ink A, while being able to extrude, since Members 31M and 31P are formed in the inferior surface of tongue of 31H, respectively -- and it can be made to stabilize and breathe out Moreover, since deformation of an orifice plate 33 can be made small, even if it makes small the electrical-potential-difference value which reaches laminating piezo 36 and is impressed to 37, the pressure in liquid ink room 31C and diluent room 31H is made [effective and making it stabilize and go up, or], and power consumption can be reduced.
[0064] (1-4) The manufacture approach of the manufacture approach "carrier jet" print head 19 of a "carrier jet" print head is explained using drawing 10 . first -- thickness -- almost -- After applying resists, such as for example, a photosensitive dry film and a liquid resist ingredient, to whole surface 42A of the stainless steel member 42 of 0.1 [mm] While performing pattern exposure using the mask which has a pattern according to liquid ink room 31C, connection hole 31G, and diluent room 31H and connection hole 31L After [the stainless steel RENSU member 42], applying resists, such as for example, a photosensitive dry film and a liquid resist ingredient, to 42B on the other hand, Pattern exposure is performed using the mask which has a pattern according to ink installation hole 31D and ink passage 31E, ink buffer tank 31F, and diluent installation hole 31I, dilution liquid flow channel 31J, and diluent buffer tank 31K (drawing 10 (A)).
[0065] Then, liquid ink room 31C, connection hole 31G, and diluent room 31H and connection hole 31L are formed in whole surface 42A of the stainless steel member 42 by etching by dipping the stainless steel member 42 in the etching solution which becomes for example, in a ferric chloride water solution by using as a mask the resists 43 and 44 which have these patterns, respectively. Moreover, on the other hand to 42B, the solution room formation member 31 is obtained by [of the stainless steel member 42] forming ink installation hole 31D and ink passage 31E, ink buffer tank 31F, and diluent installation hole 31I, dilution liquid flow channel 31J, and diluent buffer tank 31K (drawing 10 (B)).
[0066] In this case, the amount of an etching solution is selected so that the amount of etching from one side of the stainless steel member 42 may become about [about 1 of the thickness of the stainless steel member 42 /] two. For example, the thickness of the SUTERENSU member 42 When selected by 0.2 [mm], it selects so that the amount of the etching solution from one side of the stainless steel member 42 may serve as about 0.11 [mm] extent. Thereby, it is stabilized and the dimensional accuracy of liquid ink room 31C, connection hole 31G, ink installation hole 31D, and ink passage 31E, ink buffer tank 31F, and diluent room 31H, connection hole 31L, diluent installation hole 31I, dilution liquid flow channel 31J, and diluent buffer tank 31K can be formed, while improving.
[0067] Moreover, the conditions of etching at the time of forming liquid ink room 31C, connection hole 31G, and diluent room 31H and connection hole 31L in whole surface 42A of the stainless steel member 42, since the amount of etching from one side of the stainless steel member 42 is the same, the stainless steel member 42 -- on

the other hand -- 42B -- ink installation hole 31D and ink passage 31E -- Since the conditions of etching at the time of forming ink buffer tank 31F and diluent installation hole 31I, dilution liquid flow channel 31J, and diluent buffer tank 31K can be set as the same conditions, the process of drawing 10 (B) can be performed for simple and a short time. Ink installation hole 31D and diluent installation hole 31I is formed in extent which does not have effect in the pressure buildup in liquid ink room 31C and diluent room 31H when a pressure is impressed to liquid ink room 31C and diluent room 31H, respectively here so that it may become large, respectively from the path of nozzle 33for ink A, and nozzle 33B for diluents.

[0068] then, the thickness after removing resists 43 and 44 -- about 50 [mum] -- glass transition point the resin ingredient 45 which becomes by the neo flex time below 250 [**] -- the solution room formation member 31 -- on the other hand, therefore, 31B is pasted at thermocompression bonding (drawing 10 (C)). In this case, it pastes up by giving the pressure of 20-30 [kgf/cm2] extent in the press temperature of 230 [**] extent. While being able to raise the bond strength of the solution room formation member 31 and the resin ingredient 45 by this, it can paste up efficiently.

[0069] Moreover, since nozzle 33for ink A and nozzle 33B for diluents are not formed in the resin ingredient 45 in this case, it can carry out like the segment groundbreaking which does not need a highly precise alignment precision for the solution room formation member 31 shown in drawing 10 (C) in the process which pastes up the resin ingredient 45 simply. Since the resin ingredient 45 is pasted up on the solution room formation member 31 of the condition of drawing 10 (C), without furthermore using adhesives, it can prevent beforehand that adhesives close ink passage 31E and dilution liquid flow channel 31J like before.

[0070] Next, nozzle 33B for diluents is formed in the resin ingredient 45 by irradiating excimer laser perpendicularly to the resin ingredient 45 through diluent room 31H and diluent installation hole 31I from the whole surface 31A side of the solution room formation member 31. Moreover, by forming nozzle 33A for ink in the resin ingredient 45, an orifice plate 33 is obtained by turning excimer laser to the nozzle 33A side for ink, and irradiating it aslant to the resin ingredient 45, through liquid ink room 31C and ink installation hole 31D, from the whole surface 31A side of the solution room formation member 31 (drawing 10 (D)).

[0071] In this case, since the resin ingredient 45 is used, nozzle 33for ink A and nozzle 33B for diluents can be formed easily. Moreover, since ink installation hole 31D and diluent installation hole 31I is larger than the path of nozzle 33for ink A, and nozzle 33B for diluents respectively, while being able to ease the alignment precision of the resin ingredient 45 at the time of laser beam machining, and the solution room formation member 31, the danger that laser will therefore be covered by the solution room formation member 31 at the time of laser beam machining is avoidable.

[0072] Then, the diaphragm 32 with which heights 34 and 35 were beforehand attached in whole surface 31A of the solution room formation member 31 is pasted up, for example using the adhesives of an epoxy system (drawing 10 (E)). In this case, since it is formed in 31B on the other hand, ink passage 31E and dilution liquid flow channel 31J can prevent beforehand the thing of the solution room formation member 31 for which ink passage 31E and dilution liquid flow channel 31J are therefore closed by adhesives in the adhesion process of a diaphragm 32, respectively. Therefore, the rise of ink passage 31E resulting from the blinding of adhesives and passage resistance of dilution liquid flow channel 31J is avoidable.

[0073] Moreover, since it is formed in 31B on the other hand, ink passage 31E and dilution liquid flow channel 31J can extend sharply the selection range of the adhesives used in case [of the solution room formation member 31] a diaphragm 32 is pasted up on the solution room formation member 31 as compared with the former. moreover, in case a diaphragm 32 is pasted up on whole surface 31A of the solution room formation member 31 Through tube 32B of a diaphragm 32, the alignment of connection hole 31G, and through tube 32C and alignment of connection hole 31L, Since what is necessary is to take into consideration only the alignment of a height 34, the alignment of laminating piezo 36 and liquid ink room 31C and a height 35, and laminating piezo 37 and diluent room 31H, as compared with the former, the adhesion process of a diaphragm 32 can be performed simply.

[0074] Then, after attaining to heights 34 and 35 laminating piezo 36, for example using the adhesives of an epoxy system, respectively and pasting up 37, the ink supply pipes 39 and 41 are set by the through tubes 32B and 32C of a diaphragm 32, respectively, and a diaphragm 32 is pasted. The "carrier jet" print head 19 can be obtained in this way (drawing 10 (F)).

[0075] (1-5) The block diagram 11 of laser-beam-machining equipment shows laser-beam-machining equipment

50, and after the laser beam L1 which becomes by the excimer laser discharged from the laser oscillation machine 51 passes a mask 52, image formation of it is carried out at an angle of [theta] predetermined to the normal of the whole surface of the resin ingredient 45 through a mirror 53 and a lens 54. Thereby, a through tube is formed in the resin ingredient 45 according to the output level and irradiation time of a laser beam L1, and the hole configuration of the through tube concerned is determined as it based on opening 52A of a mask 52.
[0076] The mask material incidentally produced by the multilayer coating tip of a dielectric as the quality of the material of a mask 52 when a life was not required, and the metal plate to which hole processing was performed by etching etc. is used when a complicated hole configuration is not required, a long life was required on the other hand or a complicated hole configuration was required is used.
[0077] Here, in drawing 12 (B), while making opening 52A of a mask 52 into a circle configuration, the cross-section configuration of through tube 45C formed in the resin ingredient 45 concerned when irradiating a laser beam L1 to plane-of-incidence 45A of the resin ingredient 45 at a perpendicular (theta= 90 [deg.]) is expressed. At this time, through tube 45C is formed in the shape of [to which a Mukai or intermediary bore diameter becomes small gradually at outgoing radiation side 45B from plane-of-incidence 45A] a taper. namely, from carrying out total reflection by the internal surface of through tube 45C by which a part of laser beam L1 concerned is formed in the resin ingredient 45 at the time of the exposure of a laser beam L1 It is then punctured on the taper square alpha, and opening (this is hereafter called outgoing radiation side opening) 45CY formed in outgoing radiation side 45B is small formed to opening (this is hereafter called incidence side opening) 45CX formed in plane-of-incidence 45A by this.
[0078] Therefore, the quantity of light area of laser beam L1' when forming opening 45CY an outgoing radiation side becomes small to the quantity of light area of the laser beam L1 when forming opening 45CX an incidence side (drawing 12 (A) and (C)). However, since a laser beam L1 carries out total reflection by the internal surface of through tube 45C, the output level in the opening periphery of opening 45CY will show a value higher than the output level in the interior of opening an outgoing radiation side (drawing 12 (C)). Incidentally, when the resin ingredient 45 becomes with polyimide, while the taper angle alpha is alpha> 2 [deg.], it will depend for it on the output level of a laser beam L1.
[0079] In practice, as shown in drawing 13 , laser-beam-machining equipment 50 is used, and it is thickness here. The case where incidence of the laser beam L1 is carried out by the incident angle 30 [deg.], theta= 60 [i.e.,], [deg.] to plane-of-incidence 45A of the resin ingredient 45 which becomes with the polyimide ingredient of 130 [mum] is explained. In this case, opening 52A of a mask 52 becomes with elliptical [which has predetermined magnitude]. First, when processing of the usual processing conditions, i.e., through tube 45C, is completed, the configuration of opening 45CY is expressed like drawing 14 the outgoing radiation side at the time of stopping the exposure of a laser beam L1. In addition, generally, the output level of a laser beam L1 is raised too much about (when based on an experimental result, it is more than 1.3 time) ten percent, and it is made as [stabilize / a processing result of through tube 45C].
[0080] Next, the incidence side at the time of making it go up twice [about] and making the output level of a laser beam L1 irradiate further from the time of processing of the usual processing conditions, i.e., through tube 45C, being completed, an opening 45CX and outgoing radiation side, the configuration of opening 45CY is expressed, respectively, as shown in drawing 15 (A) and (B). That is, although opening 45CX becomes with elliptical [corresponding to the configuration of opening 52A of a mask 52] an incidence side when a laser beam L1 is made to irradiate superfluously (drawing 15 (A)), on the other hand, opening 45CY becomes the end of the ellipse direction an outgoing radiation side in the configuration which has ****** partial (this is hereafter called the tip section) 45CZ (drawing 15 (B)).
[0081] Thus, it is open for free passage with opening 45CY an outgoing radiation side, and while a part of laser beam L1 irradiated by the predetermined incident angle carries out total reflection by the internal surface of through tube 45C formed in the resin ingredient 45, tip section 45CZ is formed, because the laser beam concerned which carried out total reflection concentrates and is irradiated at an end side with the optical path length long by the incident angle (drawing 13). Tip section 45CZ will be easy to be produced in opening 45CY an outgoing radiation side, so that the larger one of an incident angle is good in the range which processing can perform and an incident angle is incidentally large according to the experimental result, when processing through tube 45C. Therefore, an incident angle is good to set more than to below 30 [deg.] [deg.], theta= 60 [i.e.,], in practice.

[0082] (1-6) In actuation of the 1st example, and the configuration beyond effectiveness, nozzle 33for ink A and nozzle 33B for diluents as shown in drawing 16 (A) are formed in an orifice plate 33 by applying laser-beam-machining equipment 50 (drawing 11) at the process (drawing 10 (D)) which produces an orifice plate 33 among the production processes of the "carrier jet" print head 19.
[0083] That is, nozzle 33B for diluents is formed in the resin ingredient 45 by irradiating excimer laser perpendicularly with the usual output level to the resin ingredient 45 (drawing 10 (C)) through diluent room 31H and diluent installation hole 31I from the whole surface 31A side of the solution room formation member 31 first (drawing 16 (A)). It continues. By irradiating excimer laser aslant at a predetermined include angle to the whole surface of the resin ingredient 45 to the resin ingredient 45 through liquid ink room 31C and ink installation hole 31D with the usual output level from the whole surface 31A side of the solution room formation member 31 By making it go up twice [about] and making the output level of the excimer laser concerned irradiate further, after forming nozzle 33A for ink in the resin ingredient 45 It is open for free passage with opening 33AY the outgoing radiation side of nozzle 33A for ink, and tip section 33AZ is formed in the nozzle 33for ink A concerned (drawing 16 (A)). This tip section 33AZ is formed near the opening 33BY the outgoing radiation side of nozzle 33A for diluents according to the incident angle of excimer laser.
[0084] Thus, the ****** regurgitation of the ink extruded from nozzle 33A for (drawing 16 (B)) ink is carried out to tip section 33AZ, and it can be made to mix with sufficient directivity to nozzle 33B for diluents as a result by having been open for free passage with opening 33AY the outgoing radiation side of nozzle 33A for ink, and having formed tip section 33AZ in the nozzle 33A for ink concerned. Since a ****** meniscus is formed in tip section 33AZ, ink can make ink and a diluent separate easily furthermore, after [concerned] being mixed.
[0085] On the other hand, since the above tip sections are not formed in opening 33AX the incidence side of nozzle 33A for ink, while being able to perform the quantum of ink without resistance, when liquid ink room 31C is made to fill up with ink, it can avoid that an ink bubble arises. In addition, by [which irradiated nozzle 33B for diluents with the output level of the usual laser beam L1] having been formed, the above tip sections are not formed in opening 33BY an opening 33BX and outgoing radiation side the incidence side of the nozzle 33B for diluents concerned.
[0086] After according to the above configuration irradiating excimer laser by the predetermined incident angle from the liquid ink room 31C side and making nozzle 33A for ink form at the time of production of an orifice plate 33, To raise the output level of the excimer laser concerned furthermore therefore By being open for free passage with opening 33AY the outgoing radiation side of nozzle 33A for ink in the near location of opening 33BY the outgoing radiation side of nozzle 33A for diluents, and having formed tip section 33AZ in the nozzle 33A for ink concerned It can carry out to tip section 33AZ through the regurgitation of ink, and separation of the ink from a mixed solution, and mixing and separation of ink and a diluent can be made to perform promptly as a result. After forming nozzle 33A for a **** intermediary and ink for furthermore forming tip section 33AZ, it is not necessary to turn an orifice plate 33 over, and can end, and as a result, the production time amount of the substantial orifice plate 33 can be shortened. The print head which may improve productivity and dependability as the whole equipment in this way can be manufactured.
[0087] (2) In drawing 17 which attaches and shows the same sign to a corresponding point with the block diagram 5 of the 2nd example (2-1) "carrier jet" print head The "carrier jet" print head 60 by the 2nd example It adds to the configuration of the "carrier jet" print head 19 by the 1st example. Laminating formation of the thin film (this is hereafter called a water-repellent membrane) 62 which has the thin film (this is hereafter called the reflective film) 61 and water repellence of an adhesion side with the solution room formation member 31 of an orifice plate 33 which reflect a laser beam on the other hand (this is hereafter called a liquid regurgitation side) is carried out.
[0088] The reflective film 61 formed in the liquid regurgitation side side of this orifice plate 33 uses titanium (Ti) as a principal component, and is formed with the thin film which may reflect the laser beam which becomes by the excimer laser which passed nozzle 33for ink A, and nozzle 33B for diluents, respectively more than 50 [%]. Moreover, the water-repellent membrane 62 formed in the reflective film 61 is formed with the thin film which has the water repellence which uses gold (Au) as a principal component so that the drop regurgitation stabilized from nozzle 33for ink A and nozzle 33B for diluents may be made.
[0089] In this case, as shown in drawing 18 , the openings 61B and 62B for diluents are formed corresponding to opening 61for ink A, and 62A list, respectively so that it may be open for free passage with nozzle 33for ink A

and nozzle 33B for diluents which are formed in an orifice plate 33 and become the reflective film 61 and a water-repellent membrane 62. Thus, wavelength by applying laser-beam-machining equipment 50 (drawing 11) like the case of the 1st example as an approach of forming nozzle 33A for ink, and the openings 61A and 62A for ink It forms by irradiating the excimer laser which becomes below by 300 [nm] from the liquid ink room 31C side. Moreover, also when forming nozzle 33B for diluents, and the openings 61B and 62B for diluents, wavelength by applying laser-beam-machining equipment 50 (drawing 11) like an above-mentioned case It forms by irradiating the excimer laser which becomes below by 300 [nm] from the diluent room 31H side.

[0090] Moreover, the incident angle of the excimer laser which irradiates at the time of formation of nozzle 33A for ink is beforehand set up so that spacing between nozzle 33for ink A and nozzle 33B for diluents may be on the liquid regurgitation side side of an orifice plate 33 below 50 [mum]. While it is open for free passage with opening 33AY the outgoing radiation side of the nozzle 33A for ink concerned to the internal surface of this nozzle 33A for ink and tip section 33AZ is formed, as for the reflective film 61 and water-repellent membrane 62 which counter the tip section 33AZ concerned, the reflective film 61 and a water-repellent membrane 62 concerned are removed partially, respectively (this removed part is hereafter called thin film removal field 61AX and 62AX(s), respectively).

[0091] (2-2) the formation approach of of the reflective film and water-repellent membrane to an orifice plate -- explain how to carry out the laminating of the reflective film 61 and the water-repellent membrane 62 to the drop regurgitation side of an orifice plate 33 one by one, and form them in it in drawing 19 (A) and (B), here. As first shown in drawing 19 (A), after washing enough the orifice plate 33 put on the solution room formation member 31, it arranges in the vacuum evaporation system which does not illustrate this. In addition, it is necessary to fully perform not only cleaning washing but desiccation aiming at dehydration in this case.

[0092] Then, the quality of the material (not shown) which uses Mukai or an intermediary (Ti), for example, titanium, as a principal component is discharged using this vacuum evaporation system in the direction shown by the arrow head from the source 65 of vacuum evaporationo, and the drop regurgitation side of an orifice plate 33 is made to vapor-deposit the quality of the material concerned. Thereby, the reflective film 61 is formed by the drop regurgitation side of an orifice plate 33. In addition, thickness of the reflective film 61 at this time is taken as 0.02 [mum] extent.

[0093] Then, the quality of the material (not shown) which uses gold (Au) as a principal component from the source 65 of vacuum evaporationo of the vacuum evaporation system mentioned above is discharged to the reflective film 61 formed by the drop regurgitation side of an orifice plate 33, and the reflective film 61 is made to vapor-deposit the quality of the material concerned, as shown in drawing 19 (B). A laminating is carried out to the reflective film 61 by this, and a water-repellent membrane 62 is formed. In addition, thickness of the water-repellent membrane 62 at this time It considers as 0.2 [mum] extent.

[0094] In addition, since a water-repellent membrane 62 uses gold (Au) as a principal component by the reflective film 61 using titanium (Ti) as a principal component in this case, while being able to form continuously the reflective film 61 and a water-repellent membrane 62 using the same vacuum evaporation system, consequently being able to lessen a membrane formation routing counter, the adhesion reinforcement to the reflective film 61 of a water-repellent membrane 62 can be raised easily.

[0095] (2-3) Form the openings 61B and 62B for diluents in the reflective film 61 and a water-repellent membrane 62 further, respectively after forming nozzle 33B for diluents in an orifice plate 33 by irradiating excimer laser L1 perpendicularly from the diluent room 31H (drawing 17) side of the solution room formation member 31, as shown in laser-beam-machining approach **** drawing 20 (A) to the reflective film and a water-repellent membrane.

[0096] For this reason, while irradiating excimer laser L1 and forming nozzle 33B for diluents in an orifice plate 33 as shown in drawing 20 (A) if both the thickness of the reflective film 61 by which sequential formation was carried out, and a water-repellent membrane 62 is thin to the drop regurgitation side of an orifice plate 33, when excimer laser L1 reaches the reflective film 61 and a water-repellent membrane 62 as it is, the openings 61B and 62B for diluents can be formed, respectively.

[0097] Without specifically taking long duration to form the openings 61B and 62B for diluents with [each thickness of the reflective film 61 and a water-repellent membrane 62] a number [below] [mum], a thermal effect does not remain and it ends. Furthermore, free passage formation of the openings 61B and 62B for diluents may be carried out smoothly, without the nozzle dimensions and the level difference of nozzle 33B for diluents

which were formed in the orifice plate 33 arising. Furthermore, since nozzle 33B for diluents is perpendicularly formed in the orifice plate 33 to the drop regurgitation side of an orifice plate 33 as it is shown in drawing 21 just before penetration formation of the nozzle 33B for diluents is carried out, it goes straight on, without reflected light L1A by the reflective film 61 of excimer laser L1 irradiating the internal surface of the nozzle 33B for diluents concerned, and can avoid that laser beam machining of the internal surface concerned is carried out as a result.

[0098] Then, as shown in drawing 20 (B), after forming nozzle 33A for ink in an orifice plate 33 by irradiating excimer laser L1 by the predetermined incident angle from the liquid ink room 31C (drawing 17) side of the solution room formation member 31, the openings 61A and 62A for ink are further formed in the reflective film 61 and a water-repellent membrane 62, respectively. As it is shown in drawing 22 just before penetration formation of the nozzle 33A for ink is furthermore carried out at an orifice plate 33, in the reflective film 61, a part reflects excimer laser L1.

[0099] By the reflective film 61, since the rate reflected rather than the rate which absorbs excimer laser L1 is higher, while a part forms opening 61A for ink in the reflective film 61 among excimer laser L1, the other sections reflect by the reflective film 61 as reflected light L1B, and are irradiated by the internal surface of nozzle 33A for ink. Thereby, reflected light L1B of excimer laser L1 forms tip section 33AZ in the internal surface of nozzle 33A for ink, and the drop regurgitation side of an orifice plate the outgoing radiation side of ****** and nozzle 33A for ink like the case of the 1st example at opening 33AY (it is drawing 22 to drawing 16 (A) and the (B) list).

[0100] Since nozzle 33A for ink is formed by whenever [predetermined tilt-angle] to the drop regurgitation side of an orifice plate 33 here, After nozzle 33A for ink is formed, in between [until opening 61A for ink is formed in the reflective film 61] As shown in drawing 22 , reflected light L1B by the reflective film 61 of excimer laser L1 is irradiated by the internal surface of the nozzle 33A for ink concerned, and, as a result, laser beam machining of the internal surface concerned is carried out. This means that laser beam machining is performed to a part of internal surface of nozzle 33A for ink which is not on the optical path of the excimer laser L1 in case the reflective film 61 is not formed in the drop regurgitation side of an orifice plate 33. In addition, while it is therefore open for free passage with opening 33AY the outgoing radiation side of nozzle 33A for ink to reflected light L1B in this case and tip section 33AZ is formed in the internal surface of the nozzle 33A for ink concerned, since it cannot exist if the reflective film 61 and water-repellent membrane 62 which counter the tip section 33AZ concerned are also independent, therefore, it is blown away by reflected light L1B.

[0101] Since the reflective film 61 and water-repellent membrane 62 which counter opening 33AY the outgoing radiation side of nozzle 33A for ink are removed, reflected light L1B of excimer laser L1 stops moreover, existing, when penetration formation of the nozzle 33A for ink is carried out. For this reason, after penetration formation of the nozzle 33A for ink is carried out, it can avoid that excimer laser L1 is irradiated by the internal surface of the nozzle 33A for ink concerned.

[0102] That is, it will depend on the thickness of the reflective film 61 for the time amount by which reflected light L1B is irradiated to the internal surface of nozzle 33A for ink which is not on the optical path of the excimer laser L1 in case the reflective film 61 is not formed in the drop regurgitation side of an orifice plate 33. Therefore, the time amount by which reflected light L1B is irradiated to the internal surface of nozzle 33A for ink is controllable by setting the thickness of the reflective film 61 as desired thickness.

[0103] Moreover, it will depend for the rate that laser beam machining of the internal surface concerned is carried out also on the output level of reflected light L1B irradiated by the internal surface concerned by irradiating reflected light L1B to the internal surface of nozzle 33A for ink. The output level of this reflected light L1B is determined according to the reflection factor of the excimer laser L1 in the reflective film 61. In addition, in the 2nd example, the reflective film 61 needs to select that from which the reflection factor which reflects the excimer laser L1 concerned to the wavelength (300 [nm]) of excimer laser L1 becomes more than 50 [%].

[0104] When the reflection factor of the excimer laser L1 in the reflective film 61 becomes below by 50 [%] here From the absorption coefficient of the excimer laser L1 in the reflective film 61 concerned becoming high The energy of reflected light L1B by a reflection factor becoming low not only runs short, but There is a possibility that it may become difficult for the time amount which forms opening 61A for ink in the reflective film 61 to be shortened, consequently to form tip section 33AZ of sufficient magnitude for the internal surface of nozzle 33A for ink.

[0105] For this reason, since nozzle 33A for ink inclines at the predetermined include angle to the drop regurgitation side of an orifice plate 33 so that the liquid regurgitation side of an orifice plate 33 is approached, and spacing between nozzle 33for ink A and nozzle 33B for diluents may become narrow, tip section 33AZ is formed near the opening 33BY the outgoing radiation side of nozzle 33B for diluents. In addition, the amount of processings of tip section 33AZ is also controlled according to the reflection factor of the excimer laser L1 in the reflective film 61, and the thickness of the reflective film 61 concerned.
[0106] (2-4) Make the drop regurgitation side of the orifice plate 33 concerned form the reflective film 61 and a water-repellent membrane 62 in actuation of the 2nd example, and the configuration beyond effectiveness at the last process which produces an orifice plate 33 among the production processes of the "carrier jet" print head 60. Then, in the making process of an orifice plate 33, while forming nozzle 33B for diluents by applying laser-beam-machining equipment (drawing 11), the openings 61B and 62B for diluents are formed in the reflective film 61 and a water-repellent membrane 62 one by one so that it may be open for free passage with the nozzle 33B for diluents concerned.
[0107] Then, while forming nozzle 33A for ink by whenever [predetermined tilt-angle] to the drop regurgitation side of an orifice plate 33 using laser-beam-machining equipment (drawing 11) similarly, the openings 61A and 61B for ink are formed in the reflective film 61 and a water-repellent membrane 62 one by one so that it may be open for free passage with the nozzle 33A for ink concerned. On the reflective film 61, the reflection factor of the laser beam by which incidence was carried out to the reflective film 61 concerned above 50 [%] in this case, and by using the thing of the quality of the material which becomes by predetermined thickness Reflected light L1B by the reflective film 61 of excimer laser L1 after nozzle 33A for ink is formed, by the time opening 61A for ink is formed in the reflective film 61 can be made to irradiate the internal surface of the nozzle 33A for ink concerned. While, being able to form opening 33AY and tip section 33AZ open for free passage in the internal surface concerned an outgoing radiation side as a result, thin film removal field 61AX and 62AX(s) can be formed in the reflective film 61 and water-repellent membrane 62 which counter the tip section 33AZ concerned, respectively.
[0108] Thus, the ****** regurgitation of the ink extruded from (drawing 18 (A)) and nozzle 33for ink A is carried out to tip section 33AZ, and it can be made to mix with sufficient directivity to nozzle 33B for diluents as a result by having been open for free passage with opening 33AY the outgoing radiation side of nozzle 33A for ink, and having formed tip section 33AZ. Since a ****** meniscus is formed in tip section 33AZ, ink can make ink and a diluent separate easily furthermore, after [concerned] being mixed.
[0109] Furthermore, since thin film removal field 61AX and 62AX(s) become equivalent to water-repellent-finishing processing not being performed, they become easy to get wet as compared with fields other than thin film removal field 61AX and 62AX(s) concerned. namely, the ink extruded from nozzle 33A for ink at the time of an ink quantum -- the reflective film 61 and a water-repellent membrane 62 -- each -- it becomes easy to exist on thin film removal field 61AX and 62AX(s). for this reason, the ink extruded from nozzle 33A for ink -- the inside of the reflective film 61 and a water-repellent membrane 62 -- each -- thin film removal field 61AX and 62AX(s) are passed preferentially, and it goes to the openings 61B and 62B for diluents which become at the tip of nozzle 33B for diluents.
[0110] Therefore, even if the ink extruded from nozzle 33A for ink at the time of the quantum of ink and a diluent is a minute amount, the openings 61B and 62B for ink which become at the tip of nozzle 33B for diluents can be made to reach in the "carrier jet" print head 60.
[0111] According to the above configuration, by predetermined thickness to the drop regurgitation side of an orifice plate 33 And after forming the reflective film 61 with which the reflection factor of a laser beam becomes above 50 [%], While forming opening 33AY and tip section 33AZ open for free passage in the internal surface of nozzle 33A for ink an outgoing radiation side By having formed thin film removal field 61AX and 62AX(s) in the reflective film 61 and water-repellent membrane 62 which counter the tip section 33AZ concerned, respectively Separation of the ink from the regurgitation and mixed solution of ink can be performed through tip section 33AZ, and mixing and separation of ink and a diluent can be made to perform promptly as a result. After forming nozzle 33A for a **** intermediary and ink for furthermore forming tip section 33AZ, it is not necessary to turn an orifice plate 33 over, and can end, and as a result, the production time amount of the substantial orifice plate 33 can be shortened. The print head which may improve productivity and dependability as the whole equipment in this way can be manufactured. In addition, the print head which the volume of ink can print with

sufficient repeatability also to the image data which becomes in a minute amount can be manufactured.
[0112] (3) In other examples, in addition above-mentioned examples, although the case where this invention was applied to serial mold printer equipment was described, this invention can apply this invention to Rhine mold printer equipment and drum-type printer equipment like drawing 23 which attaches and shows the same sign to a corresponding point not only with this but drawing 1 , and drawing 24 . As shown in drawing 23 , the Rhine head 71 which many print heads 19 are arranged in the shape of Rhine, and turn into fixes to shaft orientations, and Rhine mold printer equipment 70 is formed. Printing for one line is performed to coincidence with the Rhine head 71, and this Rhine mold printer equipment 70 is made as [print / rotate a drum by one line and / the following line], if printing is completed. In this case, all Rhine can be printed collectively, it can divide into two or more blocks, or how to print by turns every other line can be considered.
[0113] As shown in drawing 24 , if a drum 15 rotates drum rotation mold printer equipment 80, synchronizing with the rotation, ink will be breathed out from a print head 19, and an image will be formed on the print paper 17. If a drum 15 rotates one time and printing of one train is completed on the print paper 17 at a circumferencial direction, a feed screw 18 will rotate, one pitch of print heads 19 will be moved, and the next printing will be performed. In this case, there is also a method of moving a print head 19 gradually, rotating coincidence and printing a drum 15 and a feed screw 18. In a configuration so that the case of a multi-nozzle head and the same location may be printed several times, the shape of a spiral is printed, interlocking and making coincidence rotate a drum 15 and a feed screw 18.
[0114] Moreover, in an above-mentioned example, although the case where an orifice plate 33 was used as solution discharge part material which becomes with a resin ingredient was described, in addition to this, this invention can apply the solution discharge part material which becomes with various resin ingredients as solution discharge part material which becomes not only with this but with a resin ingredient. That is, as an ingredient which constitutes an orifice plate 33, the ingredient with which processing is easily made by excimer laser, and the resin ingredient which specifically becomes by polyimide, the poly ape phone, polyether imide, etc. are selected.
[0115] It is mentioned that the absorption coefficient over the wavelength (for example, 248 [nm] etc.) of excimer laser is high as a description common to these resin ingredients. However, although it is processible even if the absorption coefficient over wavelength is not so high, it is necessary to raise the power density of the laser beam which irradiates the front face of a resin ingredient in that case and, and the amount of processings of the resin ingredient per one pulse will also decrease. Therefore, when excimer laser is used as the light source for laser beam machining, the processing area of the resin ingredient mentioned above can be expanded easily, and it can be processed efficiently, and is suitable as the quality of the material which constitutes an orifice plate 33.
[0116] In a further above-mentioned example, although the case where the solution room formation member 31 which becomes by stainless steel as a pedestal which becomes with a metallic material was applied was described, in addition to this, this invention can apply various metallic materials as solution stores dept. material which becomes not only with this but with a metallic material. Thickness in a further above-mentioned example Although the case where the solution room formation member 31 which becomes by stainless steel as a pedestal which becomes with the metallic material more than 0.1 [mm] was applied was described In addition to this, this invention can apply various numeric values as thickness of not only this but the solution room formation member 31, especially is the thickness of a pedestal. If it selects more than 0.1 [mm], the almost same effectiveness as an above-mentioned example can be acquired.
[0117] In a further above-mentioned example, although the case where set ink to the quantum side and a diluent was set as a discharge side was described, this invention can realize the same effectiveness as the above-mentioned example also as the so-called configuration of an ink jet of setting not only this but ink as a discharge side, and setting a diluent to a quantum side. In this case, the configuration and actuation of a print head also come to be the same as that of an above-mentioned example. In this case, although the power of expression of a light-colored dot falls, it can obtain sufficient ink concentration about a shading part conversely.
[0118] In a further above-mentioned example, although the case where excimer laser (wavelength is abbreviation 248 [nm]) was applied as a laser beam was described, this invention can apply various things, if the laser beam which not only this but wavelength becomes below by 300 [nm] can be discharged. That is, wavelength When the laser beam more than 300 [nm] is used, it is because it becomes difficult to fully form nozzle 33for ink A and nozzle 33B for diluents.

[0119] As long as the reflection factor of not only this but a laser beam is a thing more than 50 [%], you may make it this invention form the reflective film therefore into various ingredients in a further above-mentioned example, although the case where the reflective film 61 as the 1st thin film was therefore formed into the ingredient which uses titanium (Ti) as a principal component was described. As long as this invention has not only this but water repellence, you may make it form a water-repellent membrane therefore into various ingredients in a further above-mentioned example, although the case where the water-repellent membrane 62 as the 2nd thin film was therefore formed into the ingredient which uses gold (Au) as a principal component was described.

[0120] After this invention forms only not only this but the reflective film 61 using a vacuum evaporation system, you may make it form SAITOTSUPU (trade name) which becomes with the fluororesin for example, by Asahi Glass Co., Ltd. about a water-repellent membrane 62 using the spin coat method in atmospheric air etc. in a further above-mentioned example, although the reflective film 61 and a water-repellent membrane 61 were described about the case where membranes are made to be formed using the same vacuum evaporation system.

[0121] Although the case where formed nozzle 33A for ink in the resin ingredient 45 concerned, and an orifice plate 33 was produced by irradiating excimer laser L1 aslant by 30 [deg.] to plane-of-incidence 45A of the resin ingredient 45 was described, you may make it make excimer laser L1 irradiate this invention in a further above-mentioned example by the incident angle not only this but more than 30 [deg.]. According to the experimental result, it turns out that the direction more than 30 [deg.] becomes easy for an incident angle to produce tip section 33AZ.

[0122]

[Effect of the Invention] In the manufacture approach of a print head that the orifice plate in which the exterior and a nozzle open for free passage were formed was put on the whole surface side of the pedestal in which the solution stockroom was established as mentioned above according to this invention By putting the film-like member which consists of predetermined material which becomes the whole surface of a pedestal the origin of an orifice plate, and irradiating a laser beam aslant at a predetermined include angle to the whole surface of a film-like member through the solution stockroom of a pedestal After forming a solution stockroom and a nozzle open for free passage and forming a nozzle, the output level of a laser beam by making it go up predetermined twice by a film-like member being alike on the other hand, and having formed the edge of a nozzle, and the slot open for free passage, the outflow close of a solution can be made to perform promptly through the slot concerned, and the manufacture approach of the print head which may improve the productivity and dependability as the whole equipment in this way can be realized.

[0123] Moreover, according to this invention, it sets to the manufacture approach of a print head that the orifice plate by which the exterior and a nozzle open for free passage were formed in the whole surface side of the pedestal in which the solution stockroom was established was put. While putting the film-like member which consists of predetermined material which becomes the whole surface of a pedestal the origin of an orifice plate By carrying out laminating formation of the 1st thin film which has a predetermined reflection factor in the film-like member concerned, and irradiating a laser beam aslant at a predetermined include angle to the whole surface of a film-like member through the solution stockroom of a pedestal After forming a solution stockroom and a nozzle open for free passage and forming a nozzle, it is based on the reflected light from which a laser beam is obtained by reflecting with the 1st thin film. while removing the 1st thin film which counters a slot based on the reflected light, after a film-like member is alike on the other hand, forming the edge of a nozzle, and a slot open for free passage and forming a slot While being able to make the outflow close of a solution perform promptly through the slot concerned by having been made to carry out opening of the 1st thin film so that it may be open for free passage with a nozzle based on laser beams other than the reflected light The amount of a solution can fully carry out outflow close [of the ******] in a minute amount, and can realize the manufacture approach of the print head which may improve the productivity and dependability as the whole equipment in this way.

[Translation done.]

JAPANESE [JP,09-272207,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

Drawing selection drawing 1

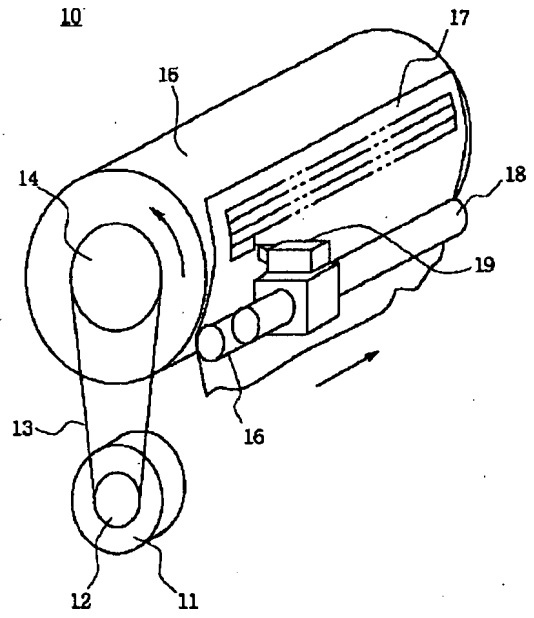

図1　シリアル型「キヤリアジエツト」プリンタ装置の構成

[Translation done.]

Drawing selection drawing 2

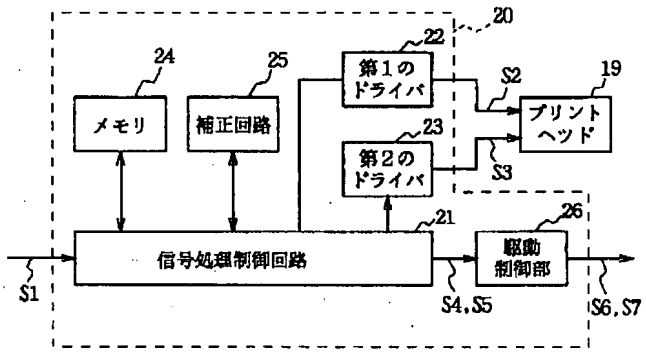

図2 「キヤリアジエツト」プリンタ装置の制御部の構成

[Translation done.]

Drawing selection drawing 3

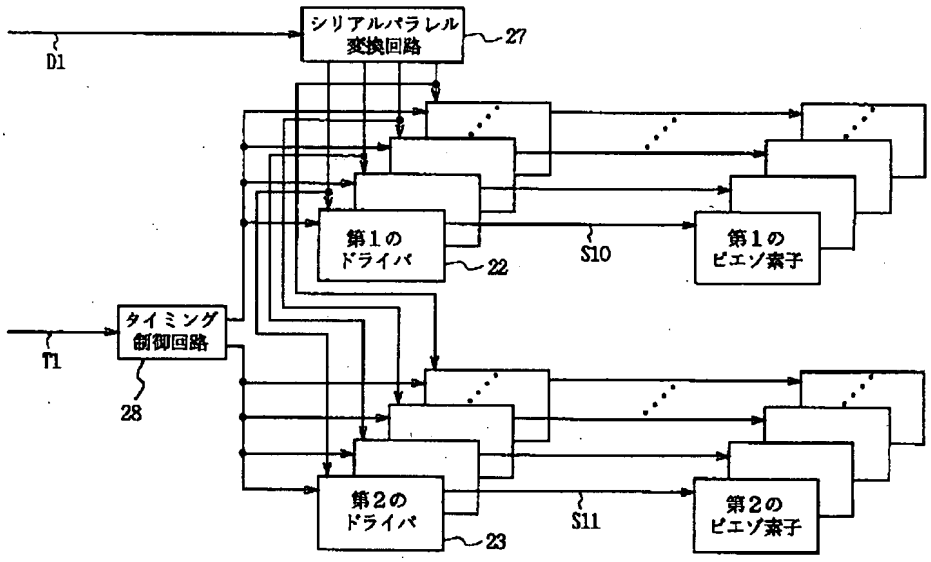

図3 ドライバの動作

[Translation done.]

Drawing selection drawing 4

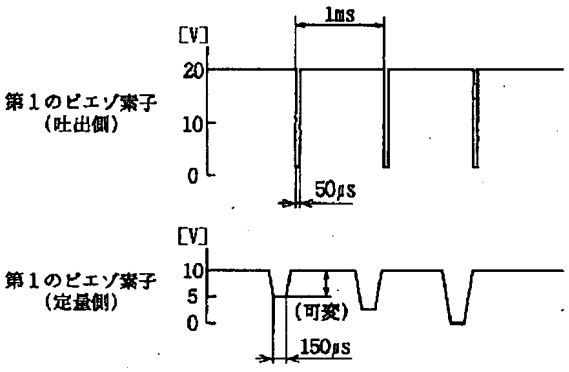

図４　駆動電圧の印加タイミング

[Translation done.]

Drawing selection drawing 5

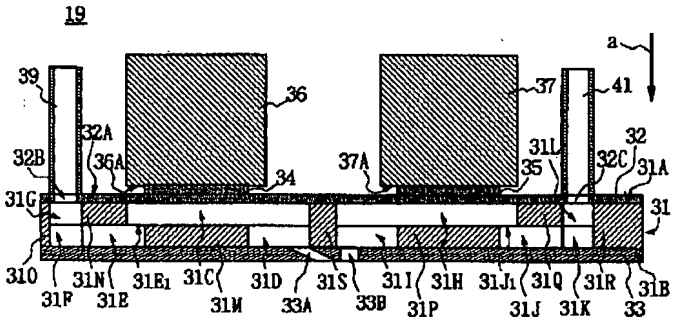

図５　第１実施例による「キヤリアジエット」
プリントヘツドの構成

[Translation done.]

Drawing selection drawing 6

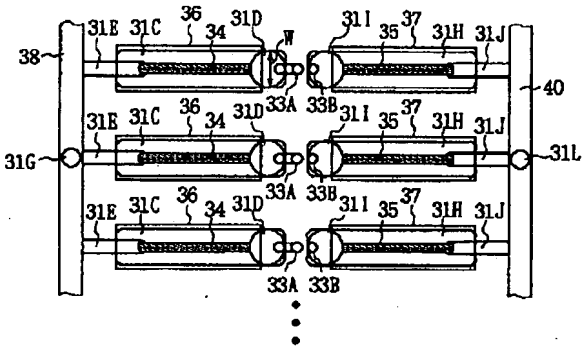

図6 第1実施例による「キヤリアジエツト」プリントヘツドの構成

[Translation done.]

Drawing selection drawing 7

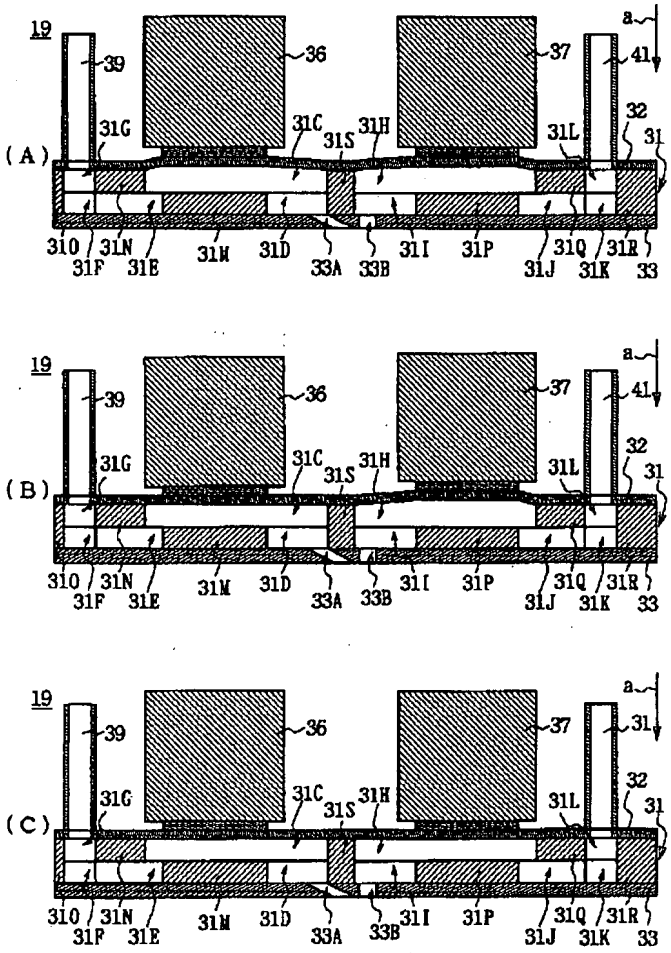

図7 「キヤリアジエット」プリントヘッドの動作

[Translation done.]